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Abstract

Rural area productivity and rural business productivity measure different things. This paper presents a empirical analysis of labour productivity differentials across the new DEFRA definition of *rural*. We find labour productivity is 21% (13%) lower in sparse (less sparse) rural areas compared to urban areas. Labour productivity in less sparse and urban areas appears to depend on similar factors. Labour productivity in sparse areas strongly relates to a different industrial structure and plants in sparse areas gain less benefit from larger capital stocks. Policy needs to be aware of these differences if the urban-rural productivity divide is to be reduced.

JEL Classification: R3; O18

Keywords: Rural; productivity; skills; industrial structure

La productivité du commerce et la productivité des espaces ruraux anglais.

Webber et al.

La productivité des espaces ruraux et la productivité du commerce mesurent des choses différentes. Cet article cherche à présenter une analyse empirique des écarts de la productivité du travail à partir de la nouvelle définition du *rural* d'après DEFRA. Il s'avère que la productivité du travail est de 21% (15%) moins élevée dans les zones rurales moins peuplées (plus peuplées) par rapport aux zones urbaines. Il semble que la productivité du travail dans les zones moins peuplées et dans les zones urbaines dépendent des facteurs similaires. La productivité du travail dans les zones moins peuplées se rapporte étroitement à une structure industrielle différente, et les établissements situés dans les zones moins peuplées profitent moins des stocks de capital plus importants. La politique devrait tenir compte de ces différences dans le but de réduire l'écart urbano-rural de la productivité.

Rural / Productivité / Compétences / Structure industrielle

Classement JEL: R3; O18

Produktivität von Betrieben und Gebieten im ländlichen England

Don Webber, Nigel Curry and Anthony Plumridge

Abstract

Bei der Ermittlung der Produktivität von ländlichen Gebieten und der von ländlichen Betrieben werden unterschiedliche Dinge gemessen. In diesem Beitrag stellen wir eine empirische Analyse der Differentiale von Arbeitsproduktivität vor, wobei das gesamte Spektrum der neuen Definition des Begriffs 'ländlich' durch die DEFRA berücksichtigt wird. Wir stellen fest, dass die Arbeitsproduktivität in dünn (weniger dünn) besiedelten ländlichen Gebieten im Vergleich zu Stadtgebieten um 21 % (13 %) niedriger ausfällt. Die Arbeitsproduktivität in weniger dünn besiedelten sowie in Stadtgebieten scheint von ähnlichen Faktoren abzuhängen. Die Arbeitsproduktivität in dünn besiedelten Gebieten steht in einem engen Zusammenhang zur unterschiedlichen industriellen Struktur; die Anlagen in dünn besiedelten Gebieten profitieren weniger von größerem Fremdkapital. Die Politik muss sich dieser Unterschiede bewusst sein, wenn die Unterschiede in der Produktivität von ländlichen und städtischen Gebieten verringert werden sollen.

JEL Classification: R3; O18

Keywords:
Ländlich
Produktivität
Qualifikationen
Industriestruktur

Productividad comercial y la productividad según áreas en las zonas rurales de Inglaterra

Don Webber, Nigel Curry and Anthony Plumridge

Abstract
Para medir la productividad de zonas rurales y la productividad de negocios rurales se utilizan métodos diferentes. En este artículo presentamos un análisis empírico de los diferenciales de productividad laboral según la nueva definición de DEFRA de lo que significa 'rural'. Observamos que la productividad laboral es un 21% menor en zonas rurales poco pobladas (13% menor en zonas rurales más pobladas) en comparación con zonas urbanas. La productividad laboral en zonas rurales más pobladas y en zonas urbanas parece depender de factores similares. La productividad laboral en zonas poco pobladas está fuertemente ligada a una estructura industrial diferente y las plantas en zonas poco pobladas obtienen menos beneficios de mayor capital social. A fin de poder reducir la división de la productividad en zonas urbanas y rurales es necesario que los líderes políticos estén al corriente de estas diferencias.

Keywords:
Rural
Productividad
Habilidades
Estructura industrial

JEL Classification: R3; O18

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1. Introduction

The study of businesses in rural areas is a rich and diverse one. FOTHERGILL and GUDGEN (1982) suggest that a shift of manufacturing employment from urban to rural areas can be observed from the late 1950s, with all types of rural business growth increasing in volume during the 1960s. KEEBLE and TYLER (1995) suggest that this continued apace during the 1970s and 1980s, but slowed into the 1990s (KEEBLE 2000), becoming even more sluggish into the new Millennium (ANDERSON *et al.*, 2005). Some even suggest (COSH and HUGHES, 2000) a deteriorating performance of rural SMEs relative to urban ones in this latter period, bucking a 40 year trend. Broadly, this pattern holds good for many parts of Europe (ROPER, 2001) and for the USA (ACS and MALECKI, 2003). Within this particular lifecycle, research has been concerned to chart the nature of this urban-rural shift and enumerate its causes for different types (manufacturing, services) and sizes (micro-businesses, SMEs, larger firms) of business.

This paper explores and quantifies the labour productivity of plants in rural areas. It represents a departure from the traditional approaches used by the Department of the Environment Food and Rural Affairs (DEFRA) in England and the Welsh Assembly Government in Wales which have been concerned to identify rural economic productivity differentials by local authority area. Making use of plant-level data, this study investigates the presence and causes of differences in labour productivity levels across the new DEFRA definition of rural areas (urban, rural less sparse, rural sparse). This is an important area for research as differences in the drivers of labour productivity across urban and rural areas may necessitate appropriate and targeted policy to reduce the urban-rural productivity divide.

This paper is organised as follows. The next section reviews studies of businesses in rural areas. Section 3 highlights the different approaches adopted in the rural area and rural business productivity literatures. The paper then seeks to identify empirically any urban-rural productivity gap and whether there are different drivers of productivity across plants located in these areas. The data employed in this study are described in Section 4 and the results are provided in Section 5. A discussion of the findings is provided in Section 6 and conclusions are collated in Section 7.

2. Studies of businesses in rural areas

Economists often focus their attention on the industrial composition of areas when examining spatial differences in aggregate productivity. For example, in describing the urban-rural shift in manufacturing since the late 1950s, FOTHERGILL and GUDGEN (1982) identify that urban firms were growing more slowly than elsewhere and much of the shift in employment from urban to rural lay in the formation of *new* firms, and with this there appeared to be an increase in profitability associated with the shift to smaller towns and to rural areas.

Reasons for differences in the levels of productivity and for changes in productivity are widely discussed. For example, FOTHERGILL and GUDGEN (1982) and FOTHERGILL *et al.* (1985) conclude that the reason for the urban-rural shift in manufacturing during the 1970s was due to a lack of physical space for expansion. TYLER *et al*. (1988) found the higher operating costs of urban areas to be significant too,

while MASSEY (1984) isolated cheaper labour in rural areas as a significant determining factor. For the service sector, however, the urban-rural shift was influenced more by desirable residential environments (KEEBLE AND TYLER, 1995), which led business owners more into niche service markets – a move towards 'flexible specialisation' (HIRST and ZEITLIN, 1992), particularly in relation to information and technology. Rural businesses also were found to be more innovative in the 1980s, but now they are considered to be no more innovative than their urban counterparts (ROPER, 2001). These temporal changes have led JARVIS and DURHAM (2003) to suggest that the performance of rural SMEs relative to their urban counterparts is so variable from the mid 1990s, that in aggregate, it is indeterminate.

Different characteristics of rural businesses

In the KEEBLE and TYLER (1995) study, rural firms (in contrast to urban ones) were overwhelmingly independent, locally owned and locally managed. They tended to be younger than their urban counterparts, and smaller (KEEBLE and NACHUM, 2002).[1] And with this younger firm profile, there was a greater tendency to innovate, to be more technically focussed and more export orientated. They (and remote rural firms in particular) also performed better than their urban counterparts across all sectors. Most rural new firm founders in this context, though, were in-migrants to the area (MITCHELL and CLARK, 1999). By contrast, most urban new firm founders were from within the urban locality. KEEBLE and NACHUM's (2002) findings confirm that rural firms were younger, smaller and growing faster than their urban counterparts; rural firms also had fewer competitors than urban ones and tended to have more dispersed networks of contacts than urban firms. In this context, there was more labour mobility between firms in the urban, more proximate, clusters, than in rural areas.

Nearly all authors writing about the rural-urban shift emphasise the importance of the rural environment as a place to live and work.[2] These quality of life determinants of location can influence firm performance in a number of ways. Whilst many authors identify a positive influence (ACS and MALECKI, 2003; TERLUIN, 2003), others found that it could make firms less ambitious and less growth orientated: they could be lifestyle

[1] The 'traditional' rural economy (agriculture, forestry, mining) invariably is omitted from this analytical theme as it has no clear urban counterpart and its contribution to rural gross value added is slight (CURDS, 2004). Studies too have assessed the external influences of firm performance (labour and premises supply, raw materials, the availability of knowledge) for urban and rural areas, and also internal factors such as entrepreneurship and motivation. They have looked at individual influences (NORTH, 1998) and several influences simultaneously to try and determine their relative strength (KEEBLE and TYLER, 1995; NORTH and SMALLBNONE, 2000). Methodologies and the geographical scale of assessments have been equally diverse, with use being made of national datasets (FOTHERGILL and GUDGEN, 1982), bespoke numeric (GALLOWAY and MOCHERIE, 2005) and attitudinal (KEEBLE and NACHUM, 2002) questionnaires and more in depth qualitative surveys (JARVIS and DUNHAM, 2003), each with their own legitimacy.

[2] Such 'quality of life' factors were first noted as a locational determinant in America in the 1950s (GREENHUT, 1956; TIEBERT, 1957). TIEBERT (1957) was to describe the smaller return that entrepreneurs were prepared to make at that time, in exchange for living in a 'nice community', often referred to as 'psychic income'. More recently, such environmental factors have been identified as being both a spur to relocate (NORTH, 1998) and a clear influence on performance (JOHNSON and RASKER, 1995).

firms, rather than entrepreneurial. The DEAKINS *et al*. (2003) study found, for example, that 86% of their sample of small rural businesses actually did not want growth. Business orientation is inextricably linked to the motivations and ambitions of the business owner (CULKIN and SMITH, 2000) and these in turn will influence the receptivity to external policy influence (for example in the area of business advice). Despite this possible 'lifestyle' influence on rural business performance, KEEBLE and TYLER (1995) found that slightly more (52%) urban entrepreneurs felt that their location might limit their success than rural entrepreneurs (50%). In the latter case, however, it is not clear whether 'limitations to success' are viewed by the entrepreneurs as preferences (my location is so enjoyable I am not preoccupied by the success of the business) or constraints (there are disadvantages to this location which limit the success of my business). In this context, only 43% of accessible rural entrepreneurs felt that their location might inhibit success.

External and internal influences on performance

Much of the writing on the urban-rural shift has stressed the importance of knowledge as an input to the firm, as an external influence on performance, and how it influences both location and clustering. Service clusters in particular benefit from sharing knowledge, particularly through tacit knowledge and knowledge spillovers. A successful 'knowledge cluster' will have a high learning capacity, high levels of knowledge exchange, networking, collaboration and personal interaction. Such knowledge clusters, however, are also highly dependent on global networks (KEEBLE and WILKINSON, 2000), but firms that are the most globally networked also can be the most locally embedded (KEEBLE and NACHUM, 2002). OAKEY and COOPER (1989) suggest that this increasing dependence on knowledge as a factor input (rather than physical raw materials) is central to the urban-rural shift. It allows firms to move to peripheral rural locations without noticeable locational disadvantages and they suggest that there are advantages of being able to source specialist (knowledge) inputs locally where clustering in these areas does take place. For such firms, inherent economic viability gives them the freedom to choose their location on personal grounds.

KEEBLE and TYLER (1995) note that skilled labour recruitment was a bigger barrier to development in both accessible and remote rural areas than urban areas in the early 1990s. To counter this, a stable labour force and lower labour costs were attractors for rural locations. Despite these findings, VASSEN and KEEBLE (1995) suggest that there were relatively more skills shortages in peripheral rural areas in England at the start of the 1990s than in urban areas, particularly in relation to professional, scientific and technical workers. This gives peripheral firms a greater propensity to become involved in training, both in-house and out-sourced. In turn this might contribute to determining their superior performance. However, 'lifestyle' businesses, for example, may be unlikely to seek training for business efficiency, suggesting that rural business support should be customised.

KEEBLE and TYLER (1995) suggest that rural areas have an advantage in that they attract a higher proportion of decision takers who are good at demonstrating

enterprising behaviour.[3] It has been suggested that only the most enterprising people move to rural areas (VASSEN and KEEBLE, 1995). Such behaviour is well suited to niche markets (ERNSTE and MEIER, 1992) in which companies can be both smaller and more footloose: a mode well suited to neo-endogenous development (WARD *et al.*, 2005). Rural firms were much more niche oriented than urban ones and the more remote they became, the more service (rather than manufacturing) orientated they tended to become. These factors suggest that 'local' rural people are not as likely to be successful at developing niche market activity as in-comers if they lack the networks that incomers bring with them. ACS and MALECKI (2003) consider these networks to be the key determinant of the success of rural businesses in America, a characteristic that they term the presence of 'entrepreneurial orientation' in the local rural economy. KEEBLE (1997) suggests too, that these networks and 'know how' have significant multiplier effects on the small town or rural location. Rural firms in this context are targeting newer, and growing more dynamic, niche market opportunities than urban ones (SMALLBONE *et al.*, 1993). This more enterprising behaviour may have reflected the more recent formation of many rural enterprises by the early 1990s, or the urban origins of most of the founders (prior to migration).

KEEBLE and NACHUM (2002), in their study of consultancy businesses, assert that there are both clear differences in performance between 'clustered' consultancies in London and dispersed ones in smaller towns and rural areas in East Anglia and the South West. Importantly, the motivations for entrepreneurs choosing these different locations also were different. For those locating in London they were 'economic' reasons (proximity to clients and to related businesses) while for those locating in a dispersed way, the motivations were non-economic ones: such as proximity to home and a pleasant environment. This suggests that there are likely to be differences in economic performance between urban and non-urban firms, but also that there might be differences between the productivity of firms (where only economic parameters are considered) and areas (where non-economic considerations can effect overall performance).

The earlier studies were concerned to identify that firms were moving in to rural areas and why, but this study is concerned to identify what causes differences in the performance of firms between urban and rural areas, and the significance of the causes in these differences in performance.

3. Rural Area Productivity and Rural Business Productivity

Rural productivity research has been overwhelmingly preoccupied with accounting for different levels of prosperity and opportunity in rural areas (OECD, 1996; BRYDEN, 1996). It has been concerned with understanding the drivers of the productivity of different rural areas and the extent to which their manipulation might improve the welfare of those residents in rural areas. Much of this work, in turn, has been driven by DEFRA'S Public Service Agreement (PSA 4) to:

[3] They define this as: "deliberate and conscious efforts of companies to enhance their competitive edge across all activities – such as production, marketing and finance – necessary for successful business operation" (p. 978).

> *"reduce the gap in productivity between the least well performing quartile of rural areas and the English median by 2008, demonstrating progress by 2006, and improve the accessibility of services for people in rural areas"* (DEFRA, 2005a, p. 7).

DEFRA's intention here is to measure differing economic performance *between* rural areas and improve the performance of the weakest (COURTNEY *et al*., 2004).

Rural economic productivity viewed in this way has a number of conventions associated with it. Firstly, rural economic productivity is measured at a spatial scale for which aggregate data are available, usually that of the local authority or the Census Output Area. Thus, COURTNEY *et al*. (2004) measured this type of productivity with data collected at the district level, for England's 149 rural local authority districts as defined by the (then) Countryside Agency. Their attempts to measure productivity at the Ward level were abandoned because of a lack of reliable data at this level of spatial disaggregation. DEFRA'S (2005a) wide-ranging review of rural productivity confirms this, stating that no proxies for productivity are available at Output, Super Output or Ward areas. The local authority district level, DEFRA hold, is the most disaggregated scale at which it is possible to measure rural productivity.

Second, this spatial construction of productivity has been measured in a number of different ways. Total gross value added (GVA) is the most common measure in general terms (BODDY *et al*., 2005), but GVA per employee and GVA per resident also have been used. These three measures are critically different for rural areas, because of the spatial density of the populations of the areas (not taking into account intra-area transportation costs) and the incidence of commuting. The 'place of residence' measure overstates productivity if used at a fairly local spatial scale, in areas where there is significant inward commuting.

Despite this, DEFRA (2005a) uses earnings per head of working age population measured at 'place of residence' as its baseline measure of rural productivity. This is justified on the grounds that it is considered that the purpose of measuring rural productivity is to improve the welfare of rural residents. In this context it is argued that this measure takes into account earnings brought in from outside the area and discounts earnings withdrawn from the area. This measure does not look at where wealth is generated, but how the rural population is contributing to, and benefiting from, the wealth of the nation (CURDS, 2003).

Both CURDS (2003) and DAFFIN *et al*. (2002) note shortcomings in the use of this measure. It could register increased rural productivity when only a redistribution of economically active population was taking place. More commuters moving into rural areas would improve this 'earnings' rural productivity measure but could, at the same time damage rural services. Rural areas tend to have lower unemployment rates than urban areas (CURRY, 2005) so there is a need to develop other employment-status-related indicators to capture the differing employment experiences in rural areas.

This paper offers a counterpoint to the approaches considered above by assessing the productivity of rural businesses, rather than rural areas. The approach investigates the factors accounting for labour productivity differentials between plants located in particular areas compared with plants in urban areas. This approach resolves some of the methodological and data problems associated with the rural area approach. Firstly,

because plant level data are examined, the issue surrounding the debate on whether to use workplace or residence based measures becomes irrelevant. Secondly, the use in this approach of GVA per worker as a measure of plant level labour productivity captures both earnings and profits while aggregate area studies using only earnings largely ignore profits.

Significantly, this rural business productivity approach overcomes some rural productivity measurement problems in relation to DEFRA'S (2004) new definition of rural, introduced at the start of 2005. DEFRA has, in fact, brought out both a new classification and a new definition of rural. The *classification* is based on a settlement morphology while the *definition* is based on the density of the population. In principle it is possible to have six types of rural area [town (less sparse); town (sparse); village (less sparse); village (sparse); dispersed (less sparse); dispersed (sparse)] (DEFRA, 2005c), but in practice this grouping cannot be readily undertaken for analytical purposes (DEFRA, 2005b) and the combination of the classification and the definition make little sense for policy formation; for example, should less sparse villages have more productive plants than sparse towns?

In this study, the new rural *definition* is used; a distinction is made between *sparse* and *less sparse* areas to allow comparisons to be made between broadly different types of rural area based on the density of population. The sparse and less sparse rural categories are then compared with data for urban areas to examine principal differences in plant productivity between rural sparse, rural less sparse and urban areas.

4. Data

Rather than using local authority level data, labour productivity is measured in this study using data from the Office for National Statistics' (ONS) Virtual Microdata Laboratory (VML) and within this the Annual Respondents Database (ARD2), which brings together a wide range of data relating to individual business units, including the Annual Business Inquiry (ONS, 2002; Barnes and Martin, 2002). The major advantage of this data source is that it allows the relationship between rural productivity and a range of drivers to be examined at the level of the individual business unit. Some public sector organizations are included but Standard Industrial Classification 100 (agriculture, forestry and fishing) firms are omitted. Although coverage is incomplete, the response rate is virtually 100% as there is a statutory requirement to participate in these surveys.

The database provides a full survey of larger firms but firms with fewer than 250 employees are sampled on a random basis and hence are not surveyed every year. Most data are available at the plant level (often referred to as the 'local unit') and there may be more than one plant within a firm.[4] The ONS imputes capital data at the plant level.[5] For

[4] As firms can have more than one plant, comparable results are generated for the whole sample and then only for single plant firms.

[5] A final issue concerning the data is that the confidentiality of the respondents. One criterion relevant here is that data can not be associated with small areas where less than ten respondent firms are located. This places a lower limit on the level of spatial disaggregation to which the analysis can be applied. It does not affect this study, however, because the purpose of this investigation is to evaluate labour productivity differences across firms that are located across the three elements of DEFRA'S rural definition (urban, rural less sparse and rural sparse) only. To reduce any further unintended inference

this reason it is felt that the best way to compare productivity across rural areas, which have a high proportion of plants with less than 250 workers, and therefore such data are not available over time, is to use a cross-sectional analysis. The 2004 dataset is used.

A wide number of area-based productivity drivers are discussed in the literature. The TREASURY (2001) has defined five generic micro-economic drivers that account for area based differences in performance. These are: employment and skills; investment; innovation; enterprise; and competition.[6]

COURTNEY *et al*. (2004) regrouped the TREASURY's classification in an attempt to accommodate less tangible elements of productivity specifically in rural areas. They postulate five main drivers. *Economic capital* embraces infrastructure and innovation and *human capital* accommodates employment, skills and enterprise. Their other three drivers are *social capital* (for example, networks and partnerships), *cultural capital* (political consensus, civic engagement) and *environmental capital* (quality of living space). Whilst the Treasury drivers apply at the aggregate area level they are less good at explaining productivity at the plant level. The factors that drive business level productivity can be categorised as both business-specific and area-specific. For this reason further variables which relate to the plant and its location are included for this analysis – specifically population density, private ownership and international ownership (American, Japanese and European). Details of the variables that are employed in this study are presented in Table 1.

{Insert Table 1 about here}

Whilst *skills* are a fundamental element in the firm's production function, employer-employee level data on skills are not conducive to policy formation at the local level. Local and regional governments are more concerned with the level of skills and human capital possessed by the area's workforce, instead of plant specific human capital. Human capital formation within the firm is a different aspect of skills but data on learning-by-doing is not currently available and probably would be mystifying due to the different needs of plants operating in different sectors in different levels of competition and at different points in their product lifecycle.

The spatial coverage of plants is biased away from rural areas. In order to use data that permit the analysis of the greatest number of plants in rural areas, to limit sampling selection bias and to use a skills-related variable that is more conducive to policy formation, Census data on qualification levels of working age residents in the district or unitary authority in which the plant is located are employed. This does not capture the skills of the workforce that travel from outside the district or unitary authority.

In aggregate area-based analysis, *investment* covers both area-specific investments in infrastructure as well as private sector fixed capital formation. Unfortunately there are no data on investment in the ARD2. Data on firm-specific capital stock are available and represent the result of past investments: capital stock is estimated by the ONS from actual and imputed investment data.

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from the results that might possess some disclosure issues, we do not report the constants in regression results; this is common in papers and reports that use this database.

[6] Despite CURDS (2003) claiming that the competition driver is not significant for rural productivity at the sub-regional scale, DEFRA (2005a) reintroduces it as a driver in their more recent review.

Clearly, the extent to which plants take part in *innovation* in improving products and processes (the third of the Treasury drivers) will have consequences for plant level total factor productivity. Aggregate level area analysis has had mixed results in using some of the area-specific variables available. Public and private sector R&D expenditure is seen to have little explanatory power in accounting for plant level productivity differentials (BODDY *et al*., 2005), as there are varying time lags before the benefits of expenditures accrue and because expenditure in one geographical area may result in implementation and spillovers elsewhere.

Limitations in the availability of data and the appropriateness of certain variables in informing plant level rural productivity necessitate slightly different variables than those used in conventional Treasury area-based studies that have been adopted hitherto in the assessment of rural business labour productivity. Nevertheless, the structure of the drivers used conforms to that of the Treasury taxonomy.

5. Labour productivity in urban, less sparse and sparse rural areas

An assessment of business productivity was undertaken for *urban* areas, *rural less sparse* areas and *rural sparse* areas separately according to the new DEFRA definitions and using the ARD. The results of the regression analyses are presented in Table 2. All of these are estimated by Ordinary Least Squares with standard errors adjusted for heteroskedasticity using White's methodology. The results are initially generated for the full sample; they are then replicated for single plant firms only in the second part of the table; this is carried out as a stability check.[7]

{Table 2 about here}

The starting point of the assessment is to observe whether there is a productivity divide across these areas. It can be seen that plants in *less sparse* and *sparse* rural areas are 13.5% and 21.6% less productive than plants in urban areas respectively. This would appear to support the proposition that only efficient plants can locate close to the core of the market where ground rents are at their highest.

Of course, this is an over-generalisation and so the purpose of the following columns is to identify the extent to which this divide can be attributable to certain groups of contributory factors. In column 2 the effect of differences in industrial structure are introduced. Different locations have different industrial compositions. Greater densities of plants towards the end of their product life-cycle and plants that are not at the forefront of technological improvements, such are theatres and hotels, will lower the identified productivity of the area. Surprisingly the magnitude of the coefficients for both the *less sparse* and *sparse* rural areas remain about the same. Therefore, although industrial composition does contribute to differences in labour productivity rates (for instance, plants operating in the manufacturing sector enhance it, while plants in the wholesale / retail and hotel / catering sectors reduce it relative to plants operating in other sectors), it may not be industrial composition alone that is driving the urban-rural productivity divide.

[7] One immediate observations is the large drop in R^2 for the full and sub-sample. The main reason for this is probably that the single-plant firms are more heterogeneous than the plants in the full sample.

Next explicit account for variations in the size of the plant (in terms of the number of employees) and the amount of plant-specific capital stock is taken into account. The literature on productivity that has evolved to take account of educational background of the local labour force also is followed. These variables have the expected sign and are statistically significant. Of particular interest is the effect on the magnitude and statistical significance of the area variables: their magnitudes fall substantially once the size of the plant is taken into account, which indicates that these explanatory variables are correlated with the area dummies. In other words, spatial differences in the size of plants, spatial differences in the amount plant-specific capital stock and spatial differences in the skill composition of the local labour force are explaining away a substantial amount of this rural-urban labour productivity divide. Whether plants locate to where the appropriate skills are in abundance or whether workers with skills locate to where their skills are in greater demand is not possible to determine from the data. Interestingly, the coefficients on the square variables of both capital and labour initially appear to have opposite signs: the enhancing effect of a larger workforce on productivity is at a decreasing rate, suggesting diseconomies of scale with respect to labour whilst capital appears to have an enhancing effect with economies of scale.

Spatial variations in plant ownership will also contribute to variations in the labour productivity between *urban*, *less sparse rural* and *sparse rural* areas. *Ownership* is controlled for in two ways, first by identifying whether the plant in question has an American, British, European or Japanese owner. The results are presented relative to the control, which in this case is the British owner. The results presented in column 4 suggest that American owned plants are about 30% more productive, with European and Japanese owned plants being about 14% and between 2.5% and 4% more productive than British owned plants respectively. The effect appears to be negligible between plants in the control group (*urban*) and plants in *less sparse* rural areas. However the addition of plant ownership backgrounds does explain part of the difference in labour productivity rates between plants in *urban* and *sparse* rural areas, as indicated by a fall in the magnitude of the *sparse* area dummy coefficient.

Finally differences in population density and private ownership backgrounds are integrated into the equation. The results suggest that privately-owned plants are about 40% more productive than non-privately owned plants. Once all of these variables have been taken into account the rural area dummies drop below traditional level of significance, indicating that the labour productivity differences across *urban*, *less sparse rural* and *sparse rural* areas of England and Wales can be attributed to variations in industrial composition, plant size (in terms of employees), plant level capital stock, variations in the educational background of the local labour force, county of ownership, population density and public/private ownership differences. Qualitatively similar results are observable for the regressions corresponding to single plant firms.

Cross-sectional pseudo-Chow tests

Table 3 presents two sets of two columns of results; the first two columns of estimates correspond to the full sample while the last two are for single plant firms only. Each column contains the explanatory regressors, an area dummy (which is equal to one if a plant is located in that DEFRA classified area) and compound variables. The purpose of

this extra test is to identify whether the explanatory variables have statistically different effects on the plants located in the respective areas. The estimation procedure is repeated using *less sparse rural* and *sparse rural* areas in columns 1 and 2 respectively. Several points of interest come to light.

First, there is evidence to suggest that the benefit gained from greater plant level capital stocks is smaller for plants located in *sparse rural* areas. This indicates that a policy to subsidise the accumulation of capital will have a smaller effect on labour productivity in *sparse rural* areas than for plants located in other areas. It would appear that, relative to other plants, those plants located in sparse rural areas do not have a comparative advantage in the production of capital intensive goods.

Second, and perhaps of most interest, it appears that plants located in *less sparse rural* areas would not benefit as much from a policy to increase the educational background of the local labour force. Although the *t*-statistic of the *high qualifications* * *sparse rural* area is not up to traditional level of confidence, the magnitude of this coefficient for sparse areas is large and positive. It may well be the case that plants located in urban and sparse areas are relatively knowledge intensive, requiring a relatively highly skilled labour force whereas plants located in *less sparse rural* areas may focus on the production of less skill-intensive output. This picture is replicated on the squared term for high qualifications, which indicates that the benefits of a more highly educated labour force to plants in *less sparse rural* areas decrease at an increasing rate. Again, this does not appear to be the case for plants located in *sparse rural* areas.

Third, the benefits of being a privately owned plant appear to be greater for *urban* plants, and least for plants located in *sparse rural* areas. This is in line with arguments that suggest non-economic considerations may affect firm performance in *sparse rural* areas more than purely economic parameters; for instance, GALLOWAY and MOCHRIE (2005) indicated that rural private entrepreneurs can be driven by factors other than profit or growth.

Fourth, the effect of industrial composition on labour productivity of *sparse rural* areas appears to be significantly different from other areas. Construction plants in sparse rural areas appear to have higher labour productivity than plants in other areas. Moreover the detracting effect on the area's average labour productivity due to wholesale/retail, catering, transport and manufacturing production is significantly less in sparse rural areas. Qualitatively similar results are observable for the regressions corresponding to multi-plant and single plant firms.

6. Labour productivity drivers and area productivity drivers in practice

The results discussed above indicate that plant level productivity differs between *urban* and *less sparse rural* areas due to reasons which fall into some of the Treasury's key drivers. There is evidence to suggest that the quality of the labour force and an area's industrial structure contribute the most to differences in business level productivity although other factors play a part.

Plants in *sparse rural* areas are less productive than in *urban* areas mainly because of different industrial structures but also because of lower plant-level capital stocks and ownership characteristics (the Treasury's 'investment' driver), the fact that the plants tend to be small and traditional (the Treasury's 'innovation' driver) and that the

areas themselves are peripheral (the Treasury's 'investment' and 'competition' drivers). COURTNEY *et al*.'s (2004) qualitative surveys of rural economic performance show that peripherality was not perceived to be a significant constraint on economic performance by individual entrepreneurs. However, this may be a misnomer; if plants are insulated from competition by distance then there is a smaller incentive for them to innovate, compete and grow. One example is garage forecourts that provide petrol: the price of petrol in rural areas is generally higher because of the additional distance and additional petrol needed to get to an alternative (spatially segregated) garage forecourt.

Common productivity drivers: area-based versus firm-based studies

Workforce characteristics are perhaps the most significant drivers in this analysis, but they are also subtle ones. At the margin, greater proportions of highly qualified workers have much smaller enhancing effects on labour productivity in *less sparse rual* areas than in *urban* or *sparse rural* areas. This subtlety is consistent with findings in area-based productivity studies, too. The COURTNEY *et al*. (2004) study, for example, found that knowledge and skills were important factors in determining rural area economic performance but significantly this influence was less to do with the skills of the resident rural population and more concerned with the ability of an area to attract people with extant skills into an area. The policy consequence of this is that the provision of skills acquisition opportunities in rural areas is much less likely to improve rural productivity than mechanisms to attract those who already have the appropriate skills into the area.

In terms of the skills driver too, DEFRA (2005a) notes the importance of higher skills to rural area productivity: they observe higher skills to be as evident in rural areas as in urban ones (measured as the proportion of the population with first degrees) but there is considerable spatial variation across different rural areas. They single out the rural micro-business, often passed on from parent to child (as with farm succession, for example), as a business type where there can be deficiencies in skills even at low skills levels; this of course is a plant-specific type of learning-by-doing. They suggest that low rural pay is often exacerbated by low educational attainment levels. Despite this, BULLER *et al*. (2003) have noted a net out-migration of less skilled workers from rural areas.

In *sparse rural* areas in particular, DEFRA (2005a) also observes that there is a low incidence of on the job training: it is harder to afford in small and micro businesses and there are fewer trainers concerned with serving specific rural needs. Job searches and rural networks also are relatively weak in rural areas, and there is often a paucity of good managerial staff in the countryside.

Industrial structure, another statistically significant driver in the rural business productivity analysis above (and particularly significant between *sparse rural* and *urban* areas) also has been noted to have an influence in area-based productivity studies. COURTNEY *et al*. (2004) found that in poorer performing rural regions, industrial decline (for example in coal mining) was felt to contribute to a downward spiral of development. New jobs tended to go to newcomers rather than local people and there was generally a lack of local entrepreneurship and leadership in fragmented communities. This poor quality of human capital leads to what they term a 'comfortable inertia'. They also note this in the case of tourism and suggest that an inherently lower level of

productivity may exist in rural areas than in urban ones because of the higher incidence of poorer performing businesses, such as hotels and catering. In this respect GETZ and CARLSEN (2005) note the small size of rural tourism businesses and limits to the incomes that can be derived from them, with little potential for growth. Wages are inherently low, there is little career structure, and in places, labour has to be imported. As a result, rural tourism enterprises often find it difficult to secure finance, recruit appropriate staff, access training and be competitive (MORISON and THOMAS, 2004). The sector also is fragmented with few large organisations and so it has a dissipated political voice (GETZ and CARLSEN, 2005).

Different productivity drivers: Area-based versus firm - based studies

Nonetheless, area-based productivity studies also show distinct differences from the rural plant level approach adopted here. Little attention is given to ownership as a driver in area-based productivity studies, for example, despite it being identified as statistically significant in this study. In contrast, a number of factors relating to the Treasury's 'competition' driver, have been noted in area-based studies, which have not been accommodated explicitly in this plant-based approach.

DEFRA (2005a), for example, notes that in sparse areas markets can be local and inward looking dominated by few firms and leading to higher prices for the consumer. This lack of competitiveness gives businesses less incentive to reduce costs and to innovate. Rural firms perceive that competition is inhibited to a greater degree by regulation, than in urban areas. ATKINSON and HURSTFIELD (2004) found that some 20% of rural firms considered regulations an obstacle to success, compared to 14% of urban firms. DEFRA (2005a) suggests that in this context developing more distant markets can make rural firms more competitive. Indeed, a larger proportion of rural firms in England exports internationally, than urban firms, particularly in respect of niche markets and high value, low bulk goods and services (MITCHELL and CLARK, 1999).

Less tangible drivers

In articulating these skills and infrastructure influences on rural productivity, area-based studies stress the importance of what BRYDEN *et al*. (2000) term 'less tangible' factors on economic performance. These factors, they claim, concern *local* comparative economic advantage in a globalising world. Less tangible factors tend to explain why rural areas (as opposed to rural businesses) with very similar characteristics in terms of resources, often show significant differences in rural economic performance (OECD, 1996). PORTER (1990) suggests that this is because such performance isn't so much dependent on the existence of resources, but on how, and where, they are deployed. For rural area economic performance, this might suggest that the *means* of development are critical (for example, participatory democratic processes). As BRYDEN *et al*. (2000) put it, rural development is something done *by* people rather than *to* people; this effect may be captured by the *private* variable, which indicates whether the firm is privately-owned.

Specifically in relation to skills, the COURTNEY *et al*. (2004) study found that attracting the already skilled into rural areas (as opposed to training the local population) was the principal spur to productivity. In turn, the main attractors for such incomers

related to a good environmental and cultural quality of life. Indirectly, therefore, it might be deduced that environmental and cultural infrastructure has an influence on rural business productivity. Other studies, such as SRINIVASAN and STEWART (2004), lend support to this line of argument.

This environmental and cultural infrastructure also can influence business start-ups. DEFRA (2005a) note that (excepting London), rural areas overall have slightly more business start-ups than the English average. Location is an important factor here for entrepreneurs. It has been suggested that this has been an influence at least since the late 1970s (FOTHERGILL AND GUDGEN, 1982). Rural areas can have attractive living conditions, good labour relations, lower wage and premises costs and greater space for expansion. In some rural areas, however, poor services can restrain business formation. Between 60% and 66% of new rural businesses are started by in-migrants and on average, self-employed incomers create 2.4 new jobs. This means that whilst the population of England has increased by 6% since 1981 rural area populations have increased by much more than this, and that some 38% of this population shift can be attributed to the attractiveness of the environment (PARK *et al*., 2004).

Area-based studies also have suggested that rural environments and 'quality of life' factors can have a positive impact on competitiveness. COURTNEY *et al*. (2004) note that such factors attract better off and well educated incomers who dynamise business, political and cultural life, leading to a positive developmental spiral. Such incomers provide an innovative economic base serving national and global markets. In some cases, the environmental quality is considered to be of international renown (for example, in the Cotswolds) and this can assist in both attracting wealthy and talented incomers and in the branding of goods and services from the region (for example, local foods). This can provide value added for all goods and services to the region and specifically can assist in the competitiveness of tourism.

Such factors also tend to attract retired incomers but their skills and knowledge, and often high pensions still make a positive contribution to the dynamism of the rural economy (MOSELEY *et al*., 2005), often through unpaid work within the social economy. LAYARD (2003), however, suggests that some people make tradeoffs between environmental quality and economic performance and are prepared to tolerate lower productivity occupations (and lower wages) in exchange for living in higher quality environments.

Public policy that affects these less tangible factors therefore becomes critical in determining an area's economic performance. Rural areas, for example, historically have been highly dependent on public subsidies and on the availability of public sector jobs. This is now generally in retreat, and the private sector and the social economy are having increasingly important roles to play in rural development. Development policies also have become decentralised. Localities have become more powerful and in control of their development processes. There is more variation in policy and practice and a more pressing need to understand good practice in individual localities (PUTNAM, 1993). Recent work by MOSELEY and PAHL (2007), for example, using qualitative approaches in a number of different case study areas, has identified some of the elements that contribute to the development of both positive and negative social capital and make recommendations about how policies and practices can be introduced to maximise the potential of the resources of individual localities

In lending support to the influence of these less tangible factors, COURTNEY *et al*. (2004) undertook a series of qualitative surveys in 'well performing' and 'poorer performing' district authorities (defined using the earnings productivity measure) and found a number of factors relating to the environmental and cultural quality of life to be at least perceived as being significant in determining economic performance. CURDS (2003) suggest that these might be important influences over rural area productivity and calls for further research in this area. CURDS (2003, p. 17), too, acknowledge these less tangible distinctly rural measures, and note the dangers of ignoring them in policy:

> *"There is currently the very real risk that DEFRA will be a lone voice for 'rural productivity' with ODPM, DTI and HMT developing urban centred productivity improvement policies which are blind or even antipathetic to the requirements of rural development"*.

7. Conclusions

Rural area productivity and rural business productivity measure different things. There is a critical importance in rural area productivity studies in the role that they have in informing rural social welfare and policies for social inclusion. Rural business productivity, on the other hand, is more squarely concerned with the performance of the firm. Both are important, however, in securing the wealth of rural areas.

Relative to urban areas, it has been found in this paper that plant level labour productivity is lower in sparse rural (less sparse rural) areas by 21% (13%). The results also suggest that labour productivity in less sparse rural and urban areas appears to depend on similar factors, although labour productivity in sparse rural areas strongly relates to a different industrial structures and plants in sparse rural areas gain less benefit from larger capital stocks. Moreover, the finding that skills and the nature of industrial structure play important roles in driving labour productivity is supported for both research perspectives – area productivity and business productivity. Skills needs (in terms of levels) are different in different rural areas and may be best secured through attracting people into rural areas rather than simply seeking to train or retrain the local population. Industrial structure problems also can be caused by a variety of factors ('older' industries in industrial decline (coal), diffuse micro-businesses (hotel and catering)) and will require discriminatory polices at both the local and sectoral levels.

At present, the measurement of rural business level performance does not accommodate the less tangible factors that appear to have a strong influence in area based studies. Whilst in some cases these influences may be indirect (a pleasant environment attracts highly skilled workers) they are nevertheless potent in identifying appropriate policy responses to securing improvements in economic performance. It could be, for example, that improving the skills base of the workforce is more successfully achieved through policies concerned with improving environmental quality (so that workers are attracted into the area) than through policies for education and training. More research into this area is required.

An important development in exploring rural business productivity, therefore, will be to seek to identify the importance of these less tangible influences, perhaps by

observing the unexplained residual variation in productivity between locations after taking into account the predominantly plant-specific variables discussed above.

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Table 1: Definitions of variables

Variable Name:	Definition:
LGVAFCpw	Log of Gross value added at factor cost per worker at the plant level. Source: ARD2 database
Urban	= 1 if the area is classified by DEFRA as urban = 0 otherwise. Source: DEFRA, 2005
Less Sparse	= 1 if the area is classified by DEFRA as less sparse = 0 otherwise. Source: DEFRA, 2005
Sparse	= 1 if the area is classified by DEFRA as Sparse = 0 otherwise. Source: DEFRA, 2005
Llunit	Log of the number of plants in the firm. Source ARD2 database
Employment	Log of the number of workers the plant employs. Source: ARD2 database
Capital	Log of the capital stock of the plant.
High Qualifications	Log of the proportion of the district's working age population with either a first degree, higher degree, NVQ levels 4 and 5, HNC, HND, qualified teacher status, qualified medical doctor, qualified dentist, qualified nurse, midwife or heath visitor. Source: Census, 2001
US ownership	= 1 if the plant has an American owner = 0 otherwise. Source: ARD2 database
Japanese ownership	= 1 if the plant has a Japanese owner = 0 otherwise. Source: ARD2 database
European ownership	= 1 if the plant has a European owner = 0 otherwise. Source: ARD2 database
Population Density	Log of the population density in the local authority district. Source: Census, 2001
Private	= 1 if the plant is privately owned = 0 otherwise. Source: ARD2 database
Construction	= 1 if the firm operates in the construction industry = 0 otherwise. Source: ARD2 database
Wholesale / Retail	= 1 if the firm operates in the wholesale or retail industries = 0 otherwise. Source: ARD2 database
Hotel / Catering	= 1 if the firm operates in the catering industry = 0 otherwise. Source: ARD2 database
Transport	= 1 if the firm operates in the transport industry = 0 otherwise. Source: ARD2 database
Manufacturing	= 1 if the firm operates in the manufacturing industry = 0 otherwise. Source: ARD2 database
Industry Control	= 1 if the firm does not operate in any of the sectors accounted for above = 0 otherwise. Source: ARD2 database.

Table 2: Regression Results

	Full Sample					Single Plant Firms only				
	1	2	3	4	5	1	2	3	4	5
n	19065	19065	19065	19065	19065	12976	12976	12976	12976	12976
Urban (Control variable)	–	–	–	–	–	–	–	–	–	–
Less Sparse	-0.135** (0.023)	-0.140** (0.023)	-0.046* (0.019)	-0.048* (0.019)	-0.019 (0.021)	-0.137** (0.026)	-0.146** (0.025)	-0.052* (0.023)	-0.053* (0.023)	-0.028 (0.026)
Sparse	-0.216** (0.031)	-0.220** (0.023)	-0.109** (0.019)	-0.097** (0.019)	-0.037 (0.029)	-0.215** (0.025)	-0.221** (0.025)	-0.101** (0.023)	-0.093** (0.022)	-0.041 (0.035)
Llunit	1.490** (0.020)	1.473** (0.025)	0.779** (0.020)	0.730** (0.020)	0.735** (0.020)	–	–	–	–	–
Llunit^2	-0.085** (0.006)	-0.079** (0.006)	-0.048** (0.004)	-0.041** (0.004)	-0.042** (0.004)	–	–	–	–	–
Employment	–	–	-0.404** (0.015)	-0.418** (0.018)	-0.417** (0.018)	–	–	-0.247** (0.021)	-0.266** (0.021)	-0.262** (0.021)
Employment^2	–	–	-0.018** (0.003)	-0.018** (0.003)	-0.017** (0.003)	–	–	-0.018** (0.003)	-0.018** (0.003)	-0.016** (0.003)
Capital stock	–	–	0.313** (0.016)	0.311** (0.016)	0.319** (0.016)	–	–	0.170** (0.020)	0.185** (0.020)	0.186** (0.020)
Capital stock^2	–	–	0.010** (0.001)	0.008** (0.001)	0.008** (0.001)	–	–	0.015** (0.002)	0.011** (0.002)	0.012** (0.002)
High Qualifications	–	–	0.763** (0.124)	0.678** (0.123)	0.568** (0.129)	–	–	0.855** (0.156)	0.782** (0.155)	0.667** (0.163)
High Qualifications^2	–	–	0.184** (0.039)	0.165** (0.039)	0.133** (0.040)	–	–	0.202** (0.049)	0.183** (0.048)	0.148** (0.050)
USA	–	–	–	0.320** (0.042)	0.297** (0.042)	–	–	–	0.304** (0.060)	0.279** (0.060)
Japan	–	–	–	0.041 (0.098)	0.025 (0.098)	–	–	–	-0.071 (0.131)	-0.098 (0.130)
European	–	–	–	0.156** (0.036)	0.137** (0.036)	–	–	–	0.172** (0.051)	0.147** (0.051)
Population Density	–	–	–	–	0.023* (0.009)	–	–	–	–	0.020 (0.011)
Private	–	–	–	–	0.399** (0.041)	–	–	–	–	0.494** (0.054)
Construction	–	0.155** (0.031)	0.134** (0.026)	0.122** (0.026)	0.111** (0.027)	–	0.206** (0.032)	0.207** (0.030)	0.202** (0.030)	0.186** (0.030)
Wholesale / Retail	–	-0.114** (0.026)	-0.038 (0.021)	-0.095** (0.021)	-0.128** (0.021)	–	-0.027 (0.030)	0.013 (0.027)	-0.024 (0.027)	-0.057* (0.027)
Hotel / Catering	–	-0.720** (0.036)	-1.149** (0.032)	-1.096** (0.031)	-1.138** (0.031)	–	-0.593** (0.039)	-0.962** (0.038)	-0.926** (0.037)	-0.963** (0.037)
Transportation	–	0.261** (0.045)	-0.270** (0.037)	-0.285** (0.037)	-0.321** (0.037)	–	0.199** (0.050)	-0.212** (0.045)	-0.206** (0.045)	-0.241** (0.045)
Manufacturing	–	0.157** (0.025)	-0.194** (0.023)	-0.274** (0.023)	-0.322** (0.023)	–	0.198** (0.026)	-0.169** (0.027)	-0.217** (0.028)	-0.274** (0.028)
R^2	0.502	0.514	0.686	0.694	0.696	0.006	0.029	0.245	0.256	0.263
F test	3966.25**	1890.82**	2572.90**	2187.41**	2009.15**	38.73***	83.37**	217.23**	186.32**	172.11**

Notes: In all regressions the dependent variable is *LGVAFCpw* and all results are generated with robust standard errors. Values in parentheses are standard errors. * and ** signify significance at least at the 5% and 1% level respectively. Constants are omitted as per the ONS requirements. Source: ONS. A proportion of the ARD database do not provide an indication of the country of ownership; in such cases there is an extra variable equal to one if the firm has an unidentified ownership country; the results for this variable are not reported.

Table 3: Pseudo Cross-sectional Chow tests

	Full Sample		Single Plant Firms only	
	1	2	1	2
n	19065	19065	12976	12976
Urban (Control variable)	–	–	–	–
Less Sparse	**-1.185** (0.420)**	–	**-1.448** (0.566)**	–
Sparse	–	**1.473** (0.562)**	–	1.111 (0.669)
Llunit	0.719** (0.023)	0.758** (0.021)	–	–
Llunit * Less Sparse	0.068 (0.040)	–	–	–
Llunit * Sparse	–	**-0.089* (0.043)**	–	–
Llunit^2	-0.039** (0.005)	-0.050** (0.004)	–	–
Llunit^2 * Less Sparse	-0.014 (0.008)	–	–	–
Llunit^2 * Sparse	**–**	**0.031** (0.010)**	–	–
Employment	-0.414** (0.021)	-0.420** (0.021)	-0.263** (0.025)	-0.245** (0.025)
Employment * Less Sparse	-0.017 (0.040)	–	0.001 (0.048)	–
Employment * Sparse	–	0.007 (0.041)	–	-0.082 (0.045)
Employment^2	-0.017** (0.003)	-0.018** (0.003)	-0.017** (0.004)	-0.019** (0.004)
Employment^2 * Less Sparse	0.002 (0.006)	–	0.006 (0.007)	–
Employment^2 * Sparse	–	0.002 (0.006)	–	**0.015* (0.007)**
Capital stock	0.323** (0.019)	0.339** (0.018)	0.189** (0.024)	0.185** (0.024)
Capital stock * Less Sparse	-0.015 (0.034)	–	-0.014 (0.044)	–
Capital stock * Sparse	–	**-0.082* (0.035)**	–	0.009 (0.044)
Capital stock^2	0.007** (0.001)	0.007** (0.001)	0.012** (0.001)	0.012** (0.002)
Capital stock^2 * Less Sparse	0.001 (0.002)	–	-0.001 (0.004)	–
Capital stock^2 * Sparse	**–**	**0.005* (0.003)**	–	-0.002 (0.004)
High Qualifications	0.651** (0.143)	0.546** (0.135)	0.755** (0.178)	0.763** (0.158)
High Qualifications * Less Sparse	**-1.183** (0.439)**	–	**-1.356* (0.587)**	–
High Qualifications * Sparse	–	1.028 (0.609)	–	1.118 (0.739)
High Qualifications^2	0.158** (0.046)	0.130** (0.042)	0.178** (0.056)	0.179** (0.050)

High Qualifications^2 * Less Sparse	**-0.335** (0.127)**	–	**-0.393* (0.169)**	–
High Qualifications^2 * Sparse	–	0.271 (0.177)	–	0.297 (0.214)
USA	0.304** (0.050)	0.300** (0.049)	0.234** (0.071)	0.285** (0.071)
USA * Less Sparse	-0.031 (0.093)	–	0.183 (0.130)	–
USA * Sparse	–	-0.038 (0.092)	–	-0.069 (0.110)
Japan	0.169 (0.126)	0.022 (0.105)	-0.023 (0.158)	-0.160 (0.145)
Japan * Less Sparse	**-0.398* (0.198)**	–	-0.204 (0.274)	–
Japan * Sparse	–	0.016 (0.303)	–	0.423 (0.250)
European	0.148** (0.043)	0.127** (0.042)	0.161* (0.058)	0.134* (0.060)
European * Less Sparse	-0.037 (0.080)	–	-0.041 (0.118)	–
European * Sparse	–	0.053 (0.081)	–	0.018 (0.106)
Population Density	0.029** (0.007)	0.028** (0.009)	0.027** (0.008)	0.025** (0.008)
Population Density * Less Sparse	-0.003 (0.016)	–	-0.003 (0.020)	–
Population Density * Sparse	–	0.001 (0.021)	–	**0.045* (0.022)**
Private	0.335** (0.046)	0.497** (0.049)	0.408** (0.056)	0.600** (0.067)
Private * Less Sparse	**-0.207* (0.098)**	–	**0.298* (0.138)**	–
Private * Sparse	**–**	**-0.416** (0.084)**	**–**	**-0.417** (0.100)**
Construction	0.108** (0.031)	0.076* (0.032)	0.176** (0.035)	0.136** (0.036)
Construction * Less Sparse	0.012 (0.060)	–	0.036 (0.069)	–
Construction * Sparse	**–**	**0.142* (0.058)**	**–**	**0.163* (0.065)**
Wholesale/Retail	-0.149** (0.025)	-0.164** (0.025)	-0.083** (0.032)	-0.093** (0.032)
Wholesale/Retail * Less Sparse	0.077 (0.047)	–	0.101 (0.061)	–
Wholesale/Retail * Sparse	**–**	**0.158** (0.048)**	–	**0.139* (0.059)**
Catering	-1.139** (0.037)	-1.183** (0.037)	-0.979** (0.044)	-1.000** (0.044)
Catering * Less Sparse	0.006 (0.069)	–	0.069 (0.086)	–
Catering * Sparse	–	**0.195** (0.070)**	–	0.155 (0.084)
Transport	-0.312** (0.045)	-0.378** (0.044)	-0.277** (0.056)	-0.284** (0.055)

Transport * Less Sparse	-0.037 (0.076)	–	0.129 (0.094)	–
Transport * Sparse	–	**0.234** (0.075)**	–	0.171 (0.093)
Manufacturing	-0.334** (0.028)	-0.365** (0.027)	-0.301** (0.033)	-0.323** (0.033)
Manufacturing * Less Sparse	0.043 (0.051)	–	0.107 (0.063)	–
Manufacturing * Sparse	**–**	**0.174** (0.052)**	**–**	**0.181** (0.061)**
Industry Control	–	–	–	–
Test for collective exclusion of compound variables (prob.)	1.35 (0.143)	3.69** (0.000)	1.21 (0.244)	2.56** (0.000)
R^2	0.697	0.697	0.264	0.264
F test	1095.64**	1121.92**	96.17**	99.36**

See notes on Table 1.